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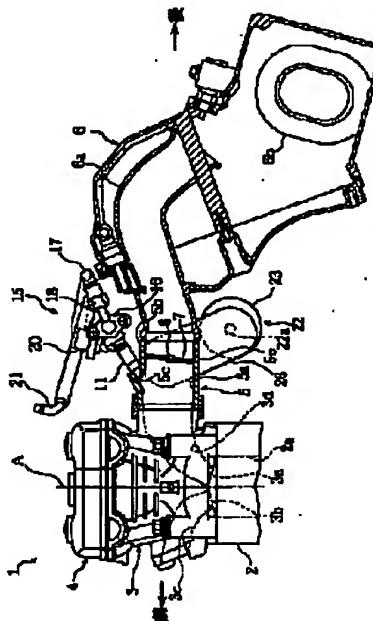
(54) **THROTTLE CONTROL DEVICE FOR ENGINE**

(57) Abstract:

PROBLEM TO BE SOLVED: To provide an engine throttle control device which can avoid upsizing of the whole engine when arranging a drive motor.

SOLUTION: This engine throttle control device has a fuel injection valve for injection supplying a fuel on an intake passage 5a and is composed such that the opening degree of the throttle valve 7 is controlled by a drive motor 22 based on the operation amount of a throttle member by an artificial operation. In this case, the drive motor 22 is disposed at a side opposite to the fuel injection valve 11 on the intake passage 5a.

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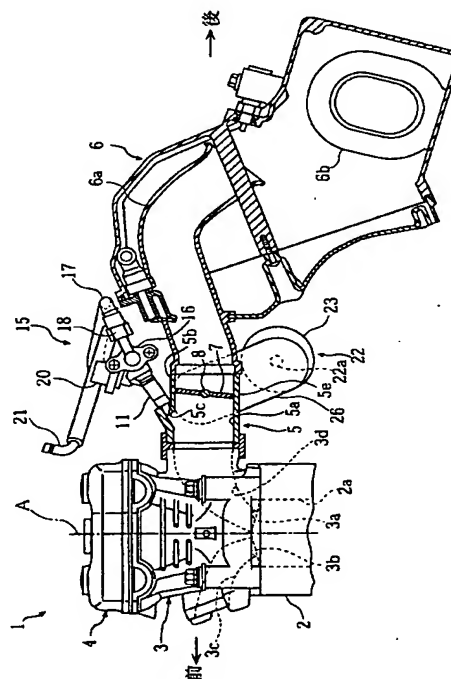
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(54) 【発明の名称】 エンジンのスロットル制御装置

(57) 【要約】

【課題】 駆動モータを配置する場合のエンジン全体の大型化を回避できるエンジンのスロットル制御装置を提供する。

【解決手段】 吸気通路 5 a に燃料を噴射供給する燃料噴射弁 1 1 を備え、スロットル弁 7 の開度をスロットル部材の人為操作によるスロットル操作量に基づいて駆動モータ 2 2 により制御するようにしたエンジンのスロットル制御装置において、上記駆動モータ 2 2 を上記吸気通路 5 a の燃料噴射弁 1 1 と反対側に配置する。



English Translation of

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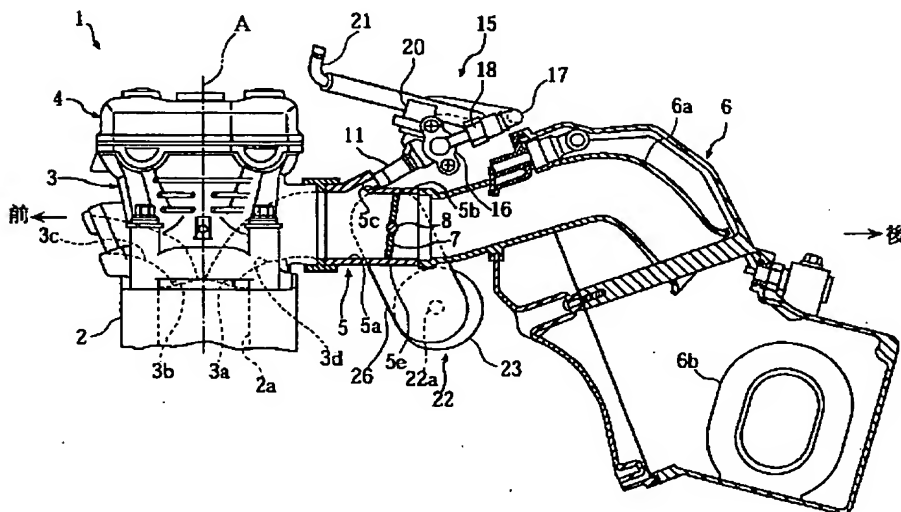
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Title: THROTTLE CONTROL DEVICE FOR ENGINE
 Application Number: 2001-059702
 Date of filing: 05.03.2001
 Inventor: YAMAGUCHI NAOYA, ITO YUICHI, SUZUKI
 IDE, SAMOTO HARUHIKO, KAMIHARA KAZUSUKE
 Applicant: YAMAHA MOTOR CO LTD

[Abstract]

PROBLEM TO BE SOLVED: To provide an engine throttle control device which can avoid upsizing of the whole engine when arranging a drive motor.

SOLUTION: This engine throttle control device has a fuel injection valve for injection supplying a fuel on an intake passage 5a and is composed such that the opening degree of the throttle valve 7 is controlled by a drive motor 22 based on the operation amount of a throttle member by an artificial operation. In this case, the drive motor 22 is disposed at a side opposite to the fuel injection valve 11 on the intake passage 5a.



[Claim(s)]

[Claim 1] The throttle control unit of the engine characterized by having arranged the above-mentioned drive motor to the fuel injection valve and the opposite side of the above-mentioned inhalation-of-air path in the throttle control unit of the engine which equips an inhalation-of-air path with the fuel injection valve which carries out injection supply of the fuel, and controlled the opening of a throttle valve by the drive motor based on the throttle control input by artificial actuation of a throttle member.

[Claim 2] The throttle control unit of the engine characterized by controlling whenever [throttle valve-opening] by the drive motor which it is juxtaposition two or more cylinder engine with which the above-mentioned engine was equipped with the fuel injection valve and the throttle valve for every gas column in claim 1, and the above-mentioned throttle valve was divided into two or more sets, and became independent for each class.

[Claim 3] The throttle control unit of the engine characterized by attaching housing of the above-mentioned drive motor in a throttle body in one in claim 1 or 2.

[Claim 4] The throttle control unit of the engine characterized by for housing of the above-mentioned drive motor making an elastic member placed between the cylinder heads, and attaching it in them directly in claim 1 or 2.

[Claim 5] The throttle control unit of the engine characterized by setting they being [any / claim 1 thru/or / of 4], and forming the air passage for taking out inhalation-of-air negative pressure to HAUJIGU of the above-mentioned drive motor.

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the throttle control unit of the engine which controlled the opening of a throttle valve by the drive motor based on the throttle closing motion input by carrying out artificial actuation of the throttle members, such as a throttle grip and an accelerator pedal.

[0002]

[Description of the Prior Art] In recent years, the control input of a throttle grip or an accelerator pedal is detected, and the so-called electronic throttle control unit which controlled the opening of a throttle valve by the drive motor based on this control input is proposed.

[0003] In arranging in the engine equipped with the fuel injection valve which carries out injection supply of the fuel for this kind of throttle control device at an inhalation-of-air path, it is desirable to arrange a drive motor etc. in a compact as much as possible, for example, avoiding interference with a fuel injection valve.

[0004]

[Problem(s) to be Solved by the Invention] however, arrangement of the above-mentioned drive motor -- by how [some], it cannot respond to the request of above-mentioned miniaturization For example, when the drive motor has been arranged so that the heel of the valve stem of a throttle valve may be countered, there is concern that the whole engine is enlarged so much, from a drive motor projecting outside. Moreover, when the above-mentioned drive motor is attached in an engine or a car body through stay etc., there is a problem that components mark increase.

[0005] This invention was made in view of the above-mentioned actual condition, and aims at offering the throttle control unit of the engine which can avoid enlargement of the whole engine in the case of arranging a drive motor.

[0006]

[Means for Solving the Problem] Invention of claim 1 equips an inhalation-of-air path with the fuel injection valve which carries out injection supply of the fuel, and is characterized by having arranged the above-mentioned drive motor to the fuel injection valve and the opposite side of the above-mentioned inhalation-of-air path in the throttle control unit of the engine which controlled the opening of a throttle valve by the drive motor based on the throttle control input by artificial actuation of a throttle member.

[0007] In claim 1, invention of claim 2 is juxtaposition two or more cylinder engine with which the above-mentioned engine was equipped with the fuel injection valve and the throttle valve for every gas column, and is characterized by controlling whenever [throttle valve-opening] by the drive motor with which the above-mentioned throttle valve was divided into two or more sets, and became

independent for each class.

[0008] Invention of claim 3 is characterized by attaching housing of the above-mentioned drive motor in a throttle body in one in claim 1 or 2.

[0009] Invention of claim 4 is characterized by for housing of the above-mentioned drive motor making an elastic member placed between the cylinder heads, and attaching it in them directly in claim 1 or 2.

[0010] Invention of claim 5 is characterized by setting they being [any / claim 1 thru/or / of 4], and forming the air passage for taking out inhalation-of-air negative pressure to HAUJIGU of the above-mentioned drive motor.

[0011]

[Function and Effect of the Invention] According to the throttle control unit concerning this invention, since the drive motor has been arranged to the fuel injection valve and the opposite side of an inhalation-of-air path, when a fuel injection valve is arranged in an inhalation-of-air path, the free space produced inevitably can be used effectively for this fuel injection valve and the opposite side, a drive motor can be arranged, and engine enlargement can be avoided.

[0012] Since it controlled by invention of claim 2 with the drive motor which divided the throttle valve into two or more sets, and became independent for each class, even when one drive motor breaks down by a certain cause, it becomes possible to continue operation with the remaining drive motor, and dependability and safety can be raised.

[0013] In invention of claim 3, since housing of the above-mentioned drive motor was attached in the throttle body in one, the attachment nature to an engine can be improved by only the part which can make stay etc. unnecessary being able to reduce components mark, and attaching a drive motor to a throttle body beforehand, and unifying.

[0014] Anchoring reinforcement can be raised in invention of claim 4, avoiding the effect on the drive motor according housing of a drive motor to engine vibration by that of a direct attachment beam through an elastic member to the cylinder head.

[0015] In invention of claim 5, since the air passage for taking out inhalation-of-air negative pressure in housing of a drive motor was formed, the air hose of the conventional dedication can be made unnecessary and the circumference of an engine can be simplified.

[0016]

[Embodiment of the Invention] The gestalt of operation of this invention is explained based on an accompanying drawing below.

[0017] some engines with which drawing 1 thru/or drawing 5 are drawings for explaining the throttle control unit of the engine by claim 1 and 1 operation gestalt (the 1st operation gestalt) of invention of three, and, as for drawing 1 , drawing 2 , and drawing 3 , the throttle control unit was arranged, respectively .. a

cross-section side elevation, a top view, rear view, drawing in which drawing 4 shows the connection section of a drive motor and a valve stem, and drawing 5 are the side elevations of the reduction gear device of a drive motor.

[0018] In drawing, 1 shows the water cooling type four-cycle juxtaposition 4-cylinder engine adopted as a motor bicycle, and this engine 1 turns a crankshaft (un-illustrating) to the cross direction, and is carried in the car-body frame (un-illustrating) while it turns each gas column axis A perpendicularly.

[0019] The above-mentioned engine 1 has the outline structure which carried out bolting association of the cylinder head 3 at the upper connecting face of the cylinder block 2 which comes to carry out the parallel arrangement of the four gas column 2a to the cross direction, and equipped the upper connecting face of this cylinder head 3 with the cylinder-head cover 4, and combined the non-illustrated crank case with the bottom connecting face of the above-mentioned cylinder block 2.

[0020] Inhalation-of-air valve-opening opening 3a and exhaust valve opening 3b are carrying out opening to the crevice which forms the combustion chamber of the above-mentioned cylinder head 3, and each of these valve-opening openings 3a and 3b are opened and closed with a non-illustrated inlet valve and an exhaust valve. Exhaust air port 3c which stands in a row in the above-mentioned exhaust valve opening 3b is drawn by the front wall of the cylinder head 3, and the exhaust pipe (un-illustrating) is connected to each exhaust air port 3c. Moreover, 3d of suction ports which stand in a row in the above-mentioned inhalation-of-air valve-opening opening 3a is drawn by the posterior wall of stomach of the cylinder head 3, and the throttle body 5 is connected to 3d of each suction port.

[0021] It is arranged so that an abbreviation horizontal may be made, air-intake-duct 6a is connected to the air suction port which is the upper edge of this throttle body 5, and each of this throttle body 5 is inserted into the common air cleaner 6, and is carrying out opening of this air-intake-duct 6a in the middle of this air cleaner 6. In addition, 6b is an air cleaner element.

[0022] And in inhalation-of-air path 5a of each above-mentioned throttle body 5, the butterfly type throttle valve 7 is arranged possible [closing motion] between the closed position and the open position. Each [these / throttle-valve 7] are connected by the common valve stem 8, and the return spring 9 which energizes a throttle valve 7 to a closed position is arranged in this valve stem 8. Moreover, the right end section of the above-mentioned valve stem 8 is equipped with the throttle opening sensor 10.

[0023] Upper wall 5b of each above-mentioned throttle body 5 is equipped with the fuel injection valve 11. Valve port 5c is formed in the downstream part of the throttle valve 7 of the above-mentioned upper wall 5b, and the nozzle of the above-mentioned fuel injection valve 11 is inserted in each of this valve port 5c. Each of this fuel injection valve 11 makes the after [slant] upper part incline, and

is arranged, and the fuel from each fuel injection valve 11 is injected towards the umbrella part rear face of an inlet valve through 3d of suction ports.

[0024] The common fuel-supply unit 15 is connected to each above-mentioned fuel injection valve 11. This fuel-supply unit 15 is arranged above the throttle body 5, assembles the left end of the fuel supply hose 17 arranged at the left end of the fuel feeding pipe 16 arranged so that it may extend in the cross direction in plane view so that it may extend in this and parallel in the shape of a KO character through the joint tubing 18, and unifies.

[0025] Insertion connection of the upper limit section of each above-mentioned fuel injection valve 11 is made at end-connection 16a by which the branching was carried out to the above-mentioned fuel feeding pipe 16. Moreover, the fuel pump (un-illustrating) is connected to the upper edge of a fuel supply hose 17. Moreover, the regulator 20 which adjusts fuel pressure is connected to the down-stream edge of the above-mentioned fuel feeding pipe 16, and this regulator 20 is connected to the non-illustrated fuel tank through the return pipe 21. In addition, 21 is a negative pressure hose which introduces inhalation-of-air negative pressure into the above-mentioned regulator 20, and the above-mentioned regulator 20 carries out adjustable setting of the fuel pressure to a fuel injection valve 11 according to inhalation-of-air negative pressure. Moreover, 19 is a harness which supplies a power source to each fuel injection valve 11, and this harness 19 is ****(ed) along with the above-mentioned fuel feeding pipe 16.

[0026] And each above-mentioned throttle valve 7 and a throttle grip (un-illustrating) are connected through the throttle control unit. This throttle control unit is equipped with the throttle actuation detection sensor (un-illustrating) which detects the control input (the amount of rotation) of the throttle grip by the operator, the drive motor 22 which carries out the closing motion drive of each above-mentioned throttle valve 7, and the controller (un-illustrating) which carries out drive control of the above-mentioned drive motor 22 based on the detection value from the above-mentioned throttle actuation detection sensor.

[0027] The above-mentioned drive motor 22 is contained in the housing 23 made from aluminum dies casting, and connection formation of the gear case 26 with which the reduction gear device 25 was contained is carried out in one at this housing 23. This gear case 26 is arranged so that it may be located between two throttle bodies 5 and 5 of a cross direction center section.

[0028] Moreover, the above-mentioned drive motor 22 is arranged in the fuel injection valve 11 and the opposite side of a throttle body 5 while it turns revolving-shaft 22a of this in parallel with a valve stem 8. The above-mentioned drive motor 22 builds low wall 5e of two right-hand side throttle bodies 5 and 5 over housing 23, attaches it, and, specifically, is being fixed. Moreover, the above-mentioned drive motor 22 is arranged so that it may expose to engine 1 lower

part, and thereby, it can maintain a drive motor 22 now from an engine lower part.

[0029] The throttle gear 27 with which the above-mentioned valve stem 8 was equipped as the above-mentioned reduction gear device 25 was shown in drawing 5, Moderation chain-sprocket 29a with which it has the middle gear train 29 which gears with the rotation gear 28 with which revolving-shaft 22a of the above-mentioned drive motor 22 was equipped on both the gears 27 and 28, and this middle gear train 29 gears on the above-mentioned rotation gear 28, It consists of moderation smallness gear 29b which gears on the above-mentioned throttle gear 27, and gear shaft 29c of the above-mentioned middle gear train 29 is supported to revolve by the gear case 26.

[0030] As shown in drawing 4, insertion immobilization of the connecting-shaft 27a which projects in the method of outside is carried out from the gear case 26, and the valve stems 8a and 8b on either side are connected with the above-mentioned throttle gear 27 at this connecting-shaft 27a. The concave prolonged in the direction of an axial center is formed in the valve stems 8a and 8b of these right and left, the heights which engage with the above-mentioned concave are formed in the both ends of the above-mentioned connecting-shaft 27a, and, thereby, both the valve stems 8a and 8b rotate to one through connecting-shaft 27a.

[0031] Next, the operation effectiveness of this operation gestalt is explained.

[0032] If an operator does rotation actuation of the throttle grip, a drive motor 22 rotates according to that control input, this rotation will be transmitted to a valve stem 8 through the reduction gear device 25, and each throttle valve 7 will rotate with rotation of this valve stem 8.

[0033] According to the throttle control device of this operation gestalt, since the drive motor 22 has been arranged to the fuel injection valve 11 and the opposite side of a throttle body 5, the free space produced inevitably can be used effectively for throttle body 5 lower part, without interfering in a fuel injection valve 11, engine enlargement can be avoided, and it can respond to the request of miniaturization. Moreover, when maintaining a drive motor 22, it can carry out easily from an engine lower part, and workability can be improved.

[0034] With this operation gestalt, since two right-hand side throttle bodies 5 and 5 were built over the above-mentioned drive motor 22, it was attached and it fixed, while the anchoring reinforcement of a drive motor 22 is securable, the connection reinforcement of throttle body 5 comrades can be raised.

[0035] Since the above-mentioned drive motor 22 was directly fixed to the throttle body 5, components mark can be reduced compared with the case where it fixes through another members, such as stay. The attachment nature to an engine can be improved by furthermore attaching a drive motor 22 to each throttle body 5 beforehand at one.

[0036] Moreover, the rise of cost can be controlled while being able to simplify

structure, since the rotation drive of all the throttle valves 7 is carried out with one drive motor 22.

[0037] In addition, although the above-mentioned operation gestalt explained the case where each fuel injection valve 11 had been arranged to upper wall 5b of a throttle body 5, when the fuel injection valve may be arranged to the low wall of a throttle body and carried out in this way, in this invention, a drive motor will be arranged to the above-mentioned fuel injection valve and the opposite side of the throttle body upper part.

[0038] Moreover, although the above-mentioned operation gestalt explained the case where it was made to transmit rotation of a drive motor 22 to a valve stem 8 through the reduction gear device 25 to the example, this invention is not restricted to this, and it is what combined a link mechanism, a wire style, or these, and you may make it rotate a valve stem 8.

[0039] For example, drawing 6 shows the modification of the moderation device of a drive motor, and shows that the same sign as drawing 5 is the same, or a considerable part among drawing. This modification is an example which geared moderation chain-sprocket 29a on the rotation gear 28 of a drive motor 22, and connected gear shaft 29c of this moderation chain-sprocket 29a, and a valve stem 8 through the link mechanism 30. This link mechanism 30 is the thing of the structure which connected the driving link member 31 fixed to gear shaft 29c, and the follower link member 32 fixed to the valve stem 8 rotatable by the arm member 33, and the same effectiveness as the above-mentioned operation gestalt is acquired also in this case.

[0040] Drawing 7 is drawing for explaining the throttle control unit by claim 1 and the 2nd operation gestalt of invention of three. The same sign as drawing 2 and drawing 3 being the same or the explanation about a sign which shows the considerable part and overlaps is omitted among drawing.

[0041] The throttle control device of this operation gestalt has composition which turned revolving-shaft 22a of this drive motor 22 in the valve stem 8 and the direction of a right angle, and has arranged it while arranging a drive motor 22 to the fuel injection valve 11 and the opposite side of a throttle body 5. And above-mentioned revolving-shaft 22a is equipped with the worm gearing 35, and this worm gearing 35 has got into gear to the worm gear 36 by which wearing immobilization was carried out at the above-mentioned valve stem 8.

[0042] With this operation gestalt, since it built and fixed to two throttle bodies 5 of a center section while the drive motor 22 is arranged to the fuel injection valve 11 and the opposite side of a throttle body 5, and having arranged this drive motor 22 so that revolving-shaft 22a may be suitable in a valve stem 8 and the direction of a right angle, free space can be used effectively and arranged, without interfering in a fuel injection valve 11, and the same effectiveness as the 1st operation gestalt is

acquired.

[0043] Drawing 8 is drawing for explaining the throttle control unit by claim 1 and the 3rd operation gestalt of invention of three.

[0044] The throttle control device of this operation gestalt is the case where the gas column axis A is arranged in juxtaposition two or more cylinder engine 40 which makes the upper part before slant come to incline. The throttle body 5 is connected to each suction-port 41a of the cylinder head 41 of this engine 40 towards the perpendicular upper part, and the downstream part is equipped with the fuel injection valve 11 from the throttle valve 7 of 5d of posterior walls of stomach of each throttle body 5.

[0045] And the drive motor 22 is arranged by the fuel injection valve 11 of each above-mentioned throttle body 5, and the front wall of the opposite side, and this drive motor 22 is being attached and fixed to the throttle body 5.

[0046] Since according to this operation gestalt it attached and fixed to the throttle body 5 in the anteversion engine 40 while having arranged the drive motor 22 to the fuel injection valve 11 and the opposite side of a throttle body 5, while being able to use effectively and arrange the free space between a throttle body 5 and an engine 40 and being able to avoid engine enlargement, it can maintain easily and the same effectiveness as the above-mentioned 1st operation gestalt is acquired.

[0047] Drawing 9 is drawing for explaining the throttle control unit by claims 2 and 3 and 1 operation gestalt (the 4th operation gestalt) of invention of six. The same sign as drawing 3 shows the same or a considerable part among drawing.

[0048] The throttle control device of this operation gestalt arranges two drive motors 45 and 45' in the fuel injection valve 11 and the opposite side of a throttle body 5, and it is constituted so that right-hand side valve-stem 8b may be driven independently for valve-stem 8a of a left-hand side gas column by right-hand side drive-motor 45' with the left-hand side drive motor 45, respectively. Each of this drive motor 45 and 45' are contained in the housing 47 with which connection formation of the gear case 46 was carried out at one, and fundamental structure is the same as the above-mentioned 1st operation gestalt.

[0049] Each above-mentioned drive motor 45 and 45' are being built over, attached and fixed to each throttle bodies 5 and 5 of left-hand side and right-hand side, the left-hand side gear case 46 is connected with the heel of left-hand side valve-stem 8a, and the right-hand side gear case 46 is connected with the toe of right-hand side valve-stem 8b.

[0050] Moreover, the air passage (un-illustrating) for taking out the negative pressure of the downstream from a throttle valve 5 is formed in each above-mentioned drive motor 45 and the anchoring connecting face of 45' and a throttle body 5. Thus, since the air passage was formed using the drive motor 45 and the anchoring connecting face of 45' and a throttle body 5, the air hose of

dedication can be made unnecessary and the circumference of an engine can be simplified.

[0051] According to this operation gestalt, since it was made to carry out the rotation drive of each valve stems 8a and 8b by two drive motors 45 and 45' independently, when one drive motor breaks down by a certain cause, operation can be continued with the drive motor of another side, and dependability and safety can be raised.

[0052] Moreover, since two throttle bodies, left-hand side and right-hand side, 5 and 5 were built over each drive motor 45 and 45' and it fixed, components mark can be reduced compared with the case where it fixes through another members, such as stay, and effectiveness as well as the above-mentioned 1st operation gestalt is acquired.

[0053] In addition, although each above-mentioned operation gestalt explained the case where attached the drive motor in the throttle body and it fixed, in this invention, direct anchoring immobilization could be carried out through the elastic member at the cylinder head, and invention of claim 4 carried out the drive motor in this way. In this case, since the anchoring reinforcement of a drive motor can be raised and engine vibration is absorbed by the elastic member, the effect on a drive motor can be controlled.

[Brief Description of the Drawings]

[Drawing 1] a part of explaining the throttle control unit of the engine by claim 1 and the 1st operation gestalt of invention of three sake -- it is a cross-section side elevation.

[Drawing 2] It is the engine top view in which the above-mentioned throttle control device was arranged.

[Drawing 3] It is the rear view of the above-mentioned engine.

[Drawing 4] It is drawing showing the connection section of the drive motor of the above-mentioned throttle control unit, and a valve stem.

[Drawing 5] It is the side elevation of the reduction gear device of the above-mentioned drive motor.

[Drawing 6] It is drawing showing the moderation device of the drive motor by the modification of the above-mentioned operation gestalt.

[Drawing 7] It is a top view for explaining the throttle control unit by claim 1 and the 2nd operation gestalt of invention of three.

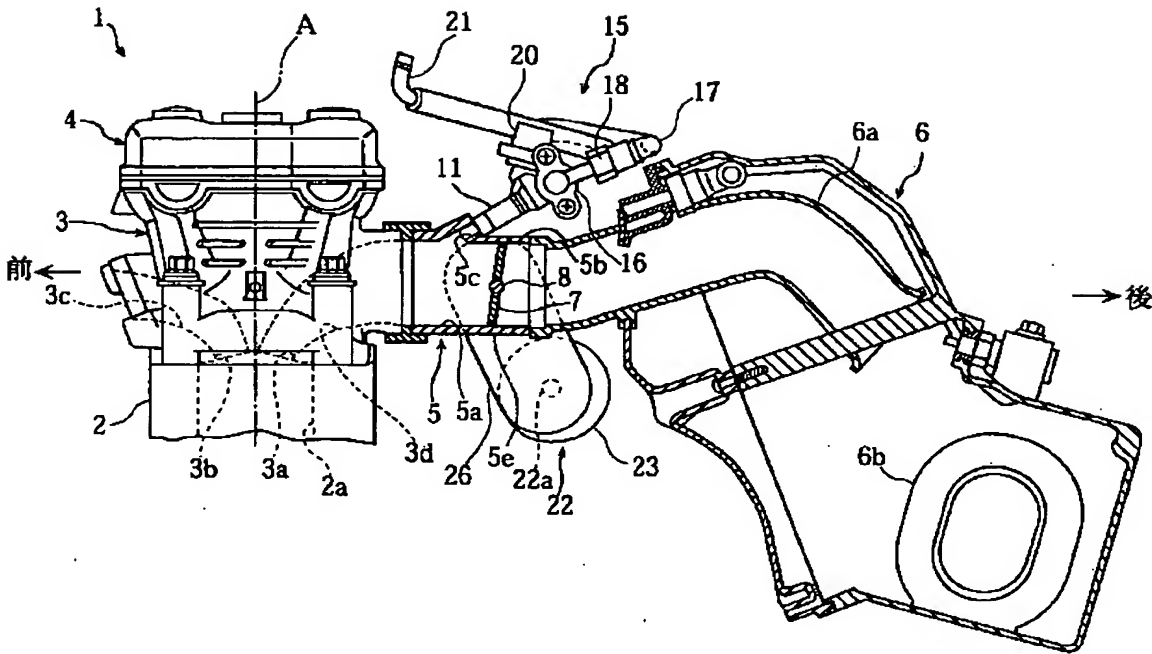
[Drawing 8] It is an outline side elevation for explaining the throttle control unit by claim 1 and the 3rd operation gestalt of invention of three.

[Drawing 9] It is the rear view for explaining the throttle control unit of the engine by claims 2 and 3 and the 4th operation gestalt of invention of six.

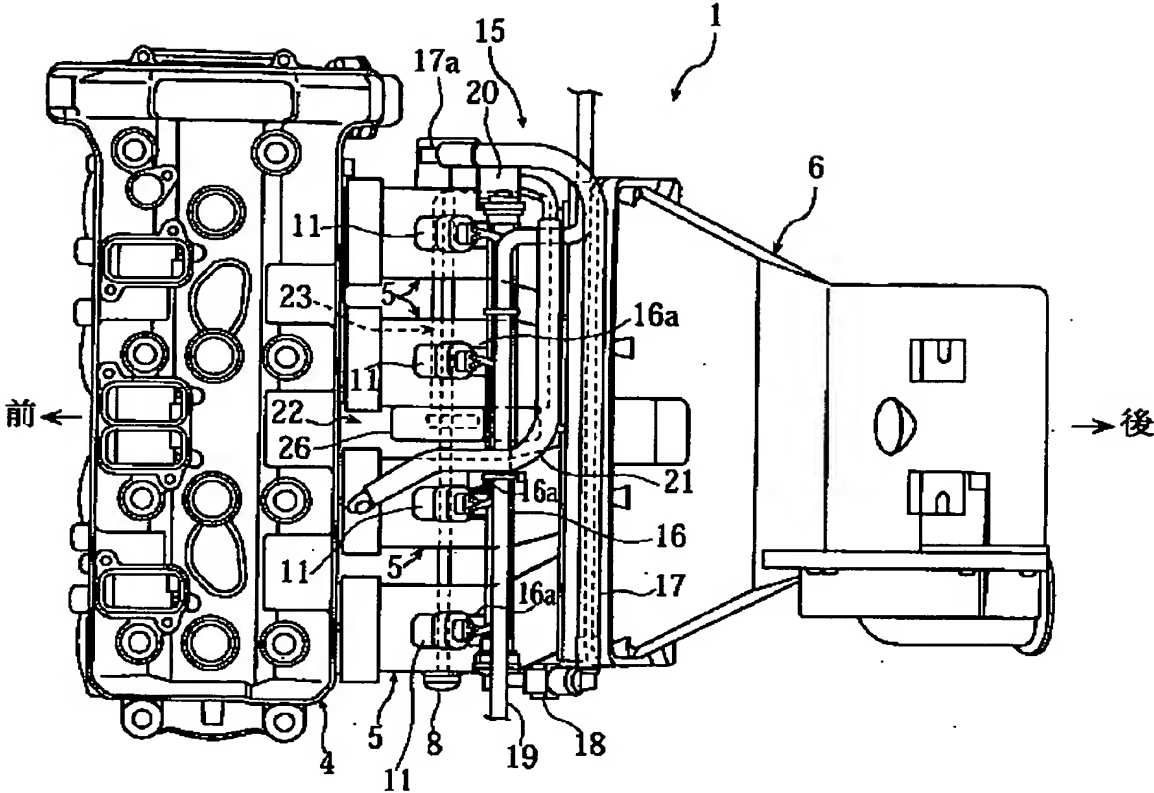
[Description of Notations]

1 40 Engine
3 41 Cylinder head
5a Inhalation of air path
5 Throttle Body
7 Throttle Valve
8, 8a, 8b, 27a Valve stem
11 Fuel Injection Valve
22 45 Drive motor
23 47 HASHIJINGU

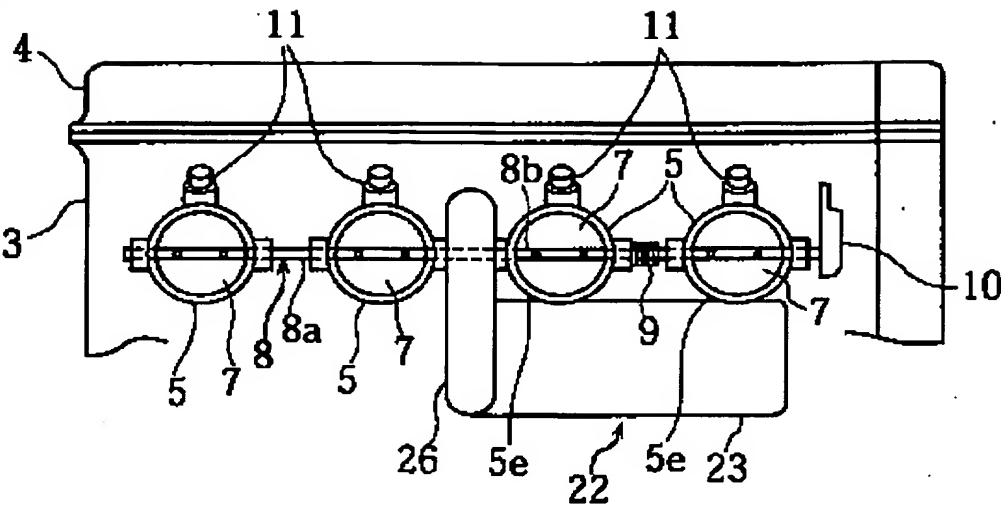
[Drawing 1]



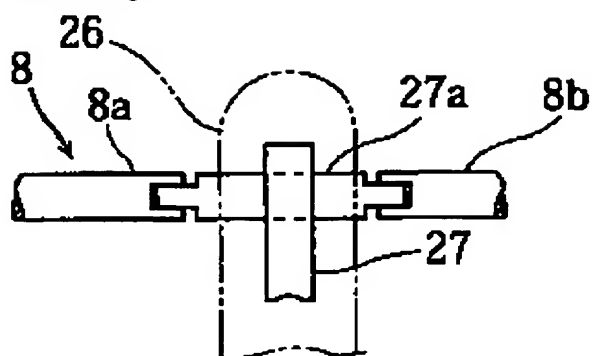
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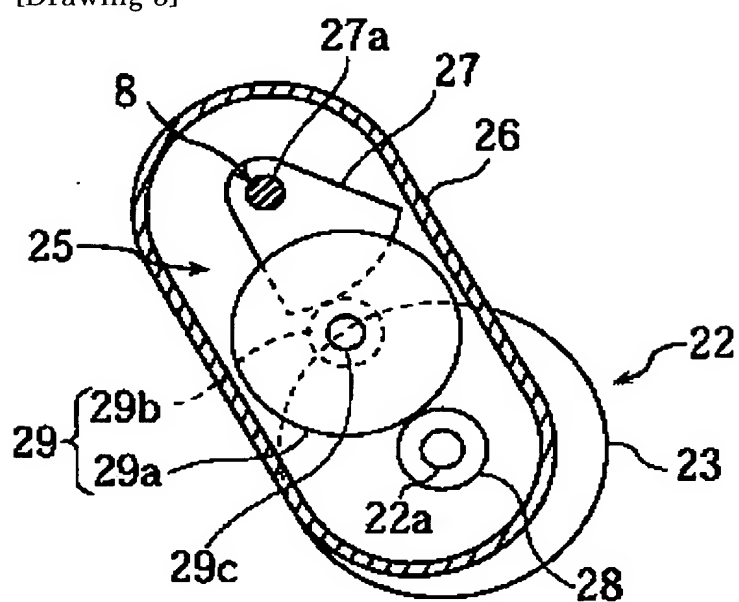
[Drawing 3]



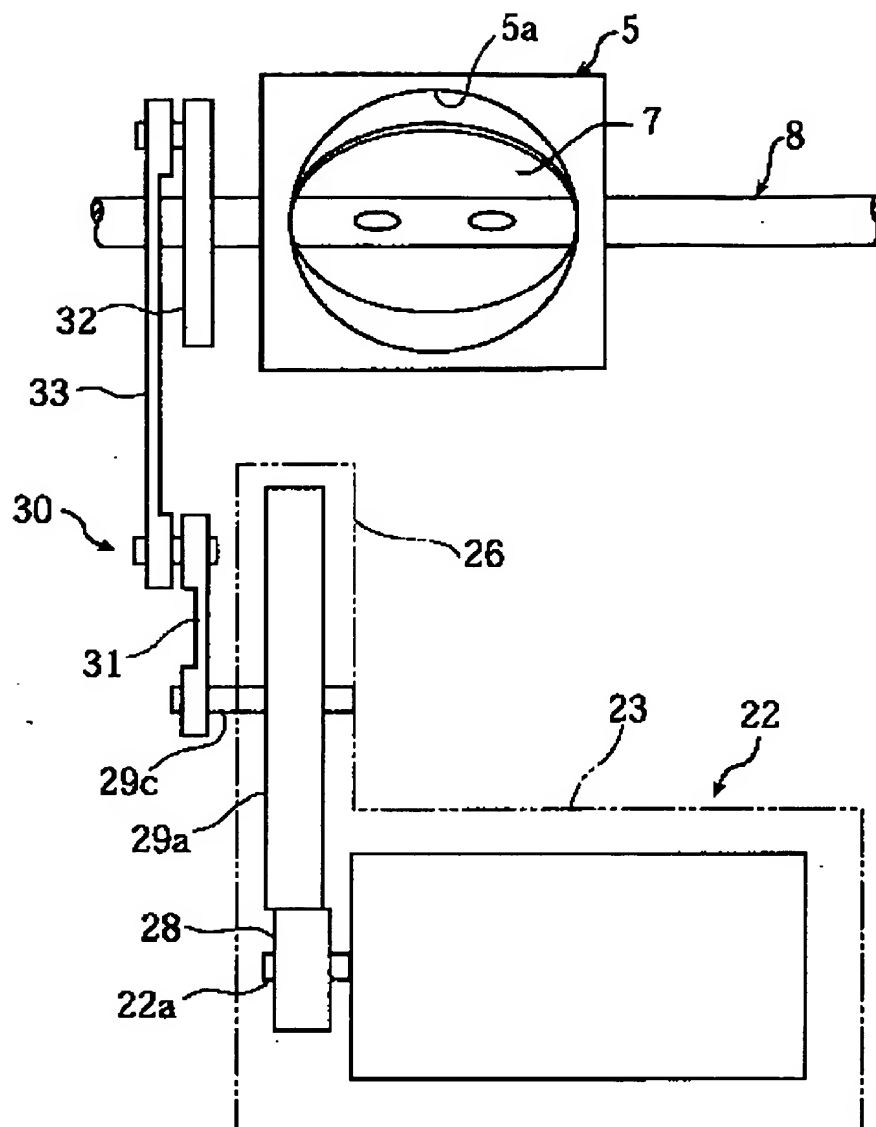
[Drawing 4]



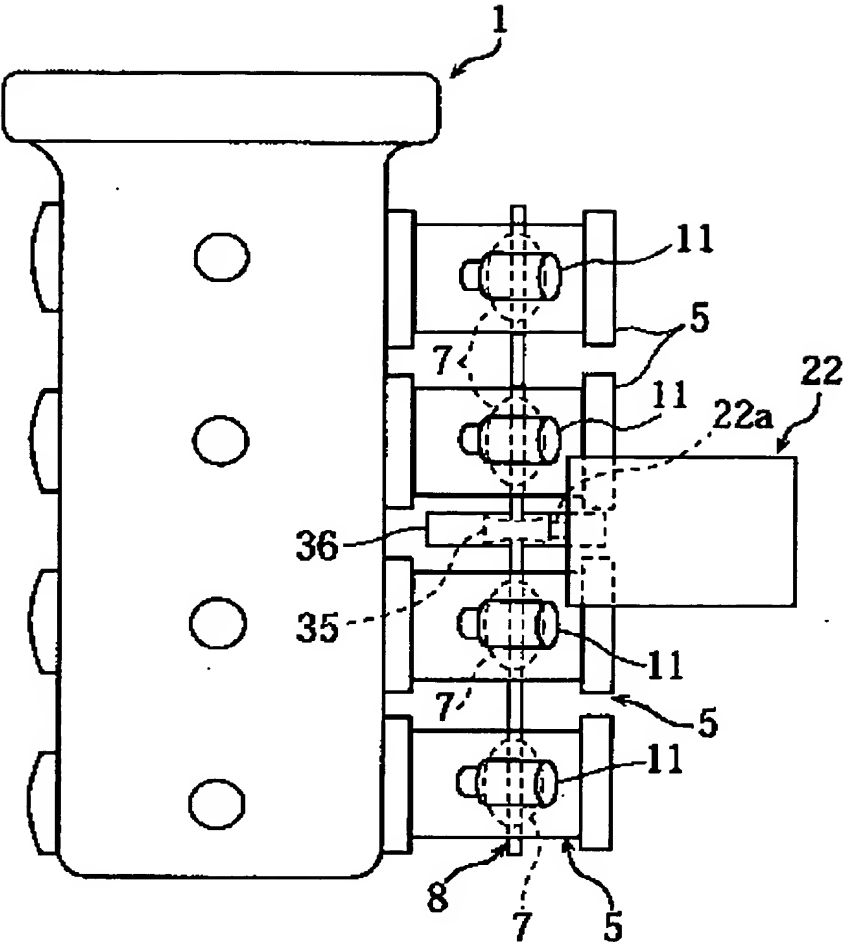
[Drawing 5]



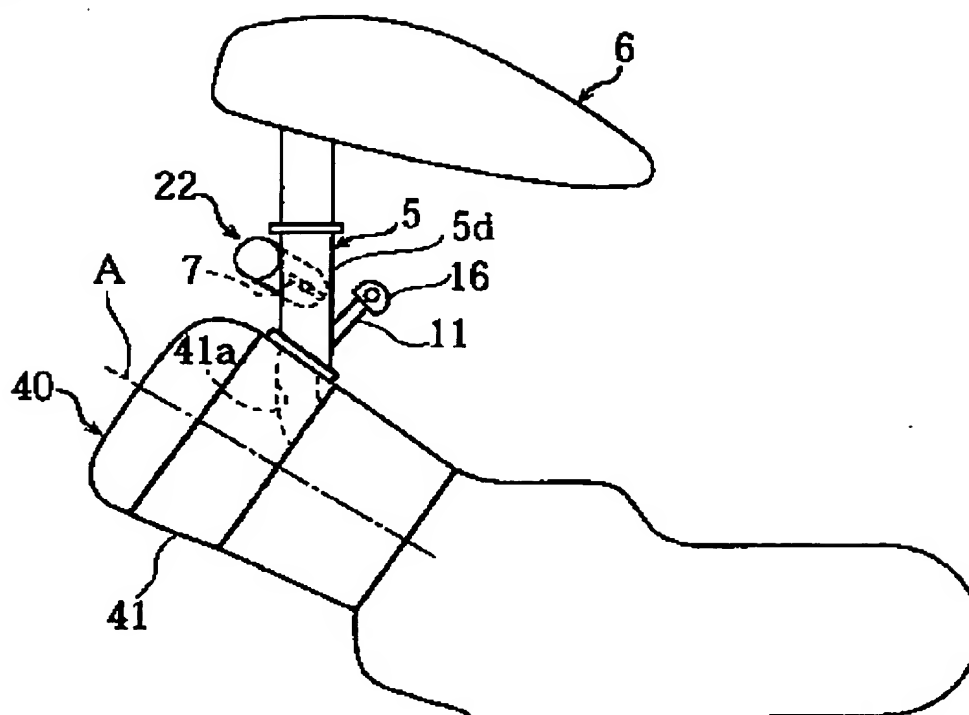
[Drawing 6]



[Drawing 7]



[Drawing 8]



[Drawing 9]

